

LISTING OF CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

1. (Currently amended) A method of calibrating an oscillator comprising:
scaling the frequency of an oscillator signal to generate a first signal;
scaling the frequency of a reference signal to generate a second signal;
synchronizing the phase of the first signal with the phase of the second signal during calibration;
generating a first signal indicative of a frequency of the oscillator;
generating a second signal indicative of a reference frequency, wherein the generating the first and second signals comprises scaling the frequency of the oscillator and scaling the reference frequency at approximately the same time so that the first and second signals are substantially in phase for calibration of the oscillator; and
adjusting the frequency of the oscillator based on a comparison of the first and second signals.
2. (Currently amended) The method of claim 1, wherein the oscillator comprises a voltage controlled oscillator, the method further comprising ~~and wherein the generating the first signal comprises~~ applying a calibration voltage to the voltage controlled oscillator, ~~and scaling the frequency of the oscillator.~~
3. (Previously presented) The method of claim 1, further comprising:
generating a calibration voltage based on temperature; and
applying the calibration voltage to the oscillator for calibration of the oscillator.
4. (Previously presented) The method of claim 1, further comprising:
enabling a phase locked loop after adjusting the frequency of the oscillator; and
testing a voltage control input to the oscillator from the phase locked loop to determine whether calibration should be performed again.

5. (Currently amended) The method of claim 1, wherein the ~~generating the second signal comprises receiving the reference frequency~~ reference signal is received from a temperature compensated crystal oscillator; and scaling the reference frequency.

6. (Currently amended) The method of claim 1, wherein the ~~scaling the frequency of the oscillator and the scaling the reference frequency at approximately the same time~~ comprises synchronizing the phase of the first signal with the phase of the second signal comprises initializing divider circuits for the frequency of the oscillator and the reference frequency at ~~approximately~~ the same time.

7. (Currently amended) The method of claim 1, wherein the oscillator comprises a voltage controlled oscillator including a number of switched capacitors, and wherein the adjusting the frequency of the oscillator based on the comparison the first and second signals comprises activating a subset of the switched capacitors based on the comparison of the first and second signals.

8. (Previously presented) The method of claim 1, further comprising:
enabling a phase locked loop following calibration of the oscillator; and
adjusting a gain of a charge pump of the phase locked loop based on a calibration setting of the oscillator.

9-16. (Withdrawn)

17. (Currently amended) An apparatus comprising:
circuitry that scales the frequency of an oscillator signal; generates a first signal indicative of a frequency of an oscillator;
circuitry that scales the frequency of a reference signal; generates a second signal indicative of a reference frequency;
circuitry that synchronizes the phase of the first signal with the phase of the second signal during calibration; wherein the circuitry that generates the first and second signals scales the frequency of the oscillator and scales the reference frequency at approximately the same time

~~so that the first and second signals are substantially in phase for calibration of the oscillator;~~
and

circuitry that adjusts the frequency of the oscillator based on a comparison of the first and second signals.

18. (Currently amended) The apparatus of claim 17, wherein the oscillator comprises a voltage controlled oscillator, ~~and wherein the circuitry that generates the first signal the~~
apparatus further comprising circuitry that applies a calibration voltage to the voltage controlled oscillator ~~and scales the frequency of the oscillator.~~

19. (Previously presented) The apparatus of claim 17, further comprising:
circuitry that generates a calibration voltage based on temperature; and
circuitry that applies the calibration voltage to the oscillator for calibration of the oscillator.

20. (Currently amended) The apparatus of claim 17, wherein the reference signal is
received circuitry that generates the second signal receives the reference frequency from a
temperature compensated crystal oscillator ~~and scales the reference frequency.~~

21. (Currently amended) The apparatus of claim 17, wherein the circuitry that ~~scales the~~
frequency of the oscillator and scales the reference frequency synchronizes the phase of the
first signal with the phase of the second signal at approximately the same time initializes
divider circuits for the frequency of the oscillator and the reference frequency at
~~approximately the same time.~~

22. (Previously presented) The apparatus of claim 17, wherein the oscillator comprises a voltage controlled oscillator including a number of switched capacitors, and wherein the circuitry that adjusts the frequency of the oscillator based on the comparison of the first and second signals activates a subset of the switched capacitors based on the comparison of the first and second signals.

23-33. (Withdrawn)

34-41. (Cancelled)

42. (Previously presented) The method of claim 1, further comprising:
generating a calibration voltage based on a proportional to absolute temperature (PTAT)
voltage; and
applying the calibration voltage to the oscillator for calibration of the oscillator.

43. (Currently amended) The method of claim 1, further comprising:
enabling a phase locked loop following calibration of the oscillator; and
initializing divider circuits for the frequency of the oscillator and the reference frequency
at approximately the same time after enabling the phase locked loop.

44. (Previously presented) The method of claim 1, further comprising:
enabling a phase locked loop following calibration of the oscillator;
testing a voltage control input provided by the phase locked loop to the oscillator; and
performing calibration of the oscillator again if the voltage control input is outside of a
predetermined range of voltages.

45. (Cancelled)

46. (New) An apparatus comprising a calibration unit, the calibration unit configured to:
receive a first scaled signal from a first circuitry, the first circuitry configured to scale
the frequency of an oscillator signal to generate the first scaled signal;
receive a second scaled signal from a second circuitry, the second circuitry configured to
scale the frequency of a reference signal to generate the second scaled signal; and
initialize the first and second circuitry at the same time during calibration.

47. (New) The apparatus of claim 46, the calibration unit further configured to generate a calibration signal based on a frequency difference between the first and second scaled signals.

48. (New) The apparatus of claim 47, the calibration signal coupled to an oscillator to control an operating frequency of the oscillator.

49. (New) The apparatus of claim 48, the oscillator being a voltage-controlled oscillator (VCO) comprising configurable circuitry to control the operating frequency of a VCO output signal, the VCO further coupled to a VCO input signal to control the instantaneous frequency of the VCO output signal.

50. (New) The apparatus of claim 49 further comprising:
a phase-locked loop (PLL) generating a PLL control voltage, the PLL comprising the first and second circuitry, the oscillator signal being the VCO output signal; and
a switch coupling either the PLL control voltage or a reference voltage to the VCO input signal.

51. (New) The apparatus of claim 50, the reference signal being a temperature-compensated crystal oscillator signal.

52. (New) The apparatus of claim 50, the calibration unit further configured to:
control the switch to couple the VCO input to the reference voltage during a calibration phase, and to couple the VCO input to the PLL control voltage during a non-calibration phase;

initialize the first and second circuitry at the same time during the calibration phase; and
adjust the VCO's configurable circuitry in response to a detected frequency difference between the first and second scaled signals.

53. (New) The apparatus of claim 52, the calibration unit further configured to initialize the first and second circuitry at the same time during the non-calibration phase.

54. (New) The apparatus of claim 49, the operating frequency of the VCO being the closest frequency the configurable VCO output frequency can be configured to a desired instantaneous VCO frequency.

55. (New) A method of calibrating a frequency synthesizer comprising:
receiving a first scaled signal from a first circuitry, the first circuitry configured to scale the frequency of an oscillator signal to generate the first scaled signal;
receiving a second scaled signal from a second circuitry, the second circuitry configured to scale the frequency of a reference signal to generate the second scaled signal;
initializing the first and second circuitry at the same time during calibration; and
generating a calibration signal based on a frequency difference between the first and second scaled signals.